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ABSTRACT

This study reports on a high school teacher using emancipatory action research to implement cooperative learning strategies in a chemistry class. Data were collected and analyzed using qualitative methods. The findings of the study indicate: (1) students accept cooperative learning if they feel it can increase their ability to learn content; (2) students need to be responsible for their own learning in order to benefit from cooperative learning; (3) cooperative learning increases reflective thinking ability, content learning, and social skills in students; and (4) testing culture and time constraints influence teacher implementation of cooperative learning. (DDR)

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Using Emancipatory Action Research to implement cooperative learning into high school chemistry teaching

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Abstract

The purpose of this study was to report a senior high school teacher, using emancipatory action research, to implement cooperative learning strategies in her chemistry class. A spiral process of identifying questions, finding students' reactions and solution used in the study. Qualitative method was used in data collection, analysis, and report the findings. Findings of the study indicated that, for a group of high achievers with strong motivation to learn, their consideration was whether cooperative learning could help them increase inner ability in the content learning. Second, in order for students to get benefit from cooperative learning, they needed to be responsible for their own learning. Third, only until students get the benefit from the cooperative learning, would they appreciate using this approach in studying content. Fourth, the outcomes of cooperative learning were increasing students' reflective thinking ability, content learning, and social skills. Fifth, testing culture, time constraints, existed curriculum paced, and characteristic of classroom culture were the factors influenced teacher in implementing cooperative learning.

Keyword: cooperative learning, action research, senior high school chemistry teacher, chemistry teaching, teacher reflection

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Introduction

Cooperative learning was proved to be an effective teaching strategies (Johnson & Johnson, 1994). Many researches have proved that cooperative learning could improve both students' content learning and social (such as cooperation and communication) skills (Cohen, 1994; Johnson & Johnson, 1994; Slavin, 1995). Although research had different views on the effective of cooperative learning in improving students' achievement scores (Burron, James & Ambrosio, 1993; Johnson & Johnson, 1994; Lonning, 1993). The effectiveness of the cooperative learning seemed to be determined by ways of teachers conduct, the context they conduct, and the length of time they conduct. On the other hand, there were many forms to conduct cooperative learning, such as student-teams-achievement divisions, team-games-tournaments, Jigsaw, Jigsaw II, Jigsaw III, group investigation, the structure approach, etc. (Sharan, 1994; Slavin, 1995). Although these forms were different among each other, but they could be categorized into six characteristic-- group goals, individual accountability, equal opportunities for success, team competition, task specialization and adaptation to individual needs (Slavin, 1995). Johnson and Johnson (1994) also distinguished the difference between group work and cooperative learning, that the later consisted of positive interdependence, individual accountability, face-to-face interaction, social skills, and group processing. However, based on our previous experience to help Taiwanese science teachers to conduct cooperative learning strategies in the class, we found many teachers were very concerned about the reality constraints—curriculum paced, examinations, and pressure from students, which made them either gave up or did not continue to work on cooperative learning in their classroom. We think what science teachers need to know was the mechanism of applying cooperative learning into traditional teaching situation, especially on how the teacher found out and solved the problems in one's teaching context.

Teacher played the key role in influencing students' learning. The spiral process of action research played an important role to help the teacher to reflect on their own teaching, to analyze one's own teaching, and to identify the problems faced in teaching context, and to find solution to improve teaching. During this process, the teacher could make connection of theory into practice, and also generate their own teaching theory (Elliott, 1991; Hopkins, 1993; Zuber-Skerritt, 1996).

The purposes of this paper was to report how a senior high school chemistry teacher-- Hung-Heng, who was the first author, using emancipatory action research to apply cooperative learning strategies into her high achievers class, how she implemented cooperative learning strategies into her class, the problems and solutions, and outcome she faced during the process, and the factors influenced Hung-Heng in revising cooperative learning strategies.

Research design

Action research was applied into this study. The authors used qualitative methods in collecting and analyzing data. Data collection included students' homework, group projects, questionnaires, interview, weekly journals; Hung-Heng's videotape, diary, her discussion with students, college professors, and colleagues. Data analysis for the qualitative part were used mainly inductive analysis, and constant comparative methods (Bogdan & Biklen, 1992). For the questionnaire part, descriptive analysis and counting the frequency of the open-ended responses were used.

The spiral approach of the research design was used, that was after using new teaching strategies, Hung-Heng would collect students' responses, and then decided whether to continue the same strategies or revise it to match students' need. Triangulation, such as checking students', colleagues and professor's, and Hung-Heng's own perception were used to maintain the quality of the findings (Elliott, 1991; Hopkins, 1993; Zuber-Skerritt, 1996).

Teaching context

Taichung girls' senior high school is one of the best girls' high school in the middle of Taiwan. The chemistry class was hold in the second year of the senior high school. Hung-Heng taught consisted of fiftyone girls in the ages of 16 to 17 years. They were very vivid and active in the class. Most of the students expected the teacher to teach them more content knowledge, help them master problem solving ability so that they can get a good grade in their learning. These high achiever students had a very strong confidence in their own learning, they were also very competitive among classmates, most of them expected to be enrolled in good universities after they graduated from senior high school and passed the competitive entrance examinations.

Hung-Heng had fourteen years teaching experience in junior high school general science, most of her teaching experience was gifted students and/or high ability students. This was her second year in teaching senior high school chemistry class. She had a strong confident in and beliefs about teaching. To Hung-Heng, she did not think teacher need to teach the high ability students how to study, but is was very important to teach them the social skills, that was the main reason why she chose cooperative learning to improve her teaching. Hung-Heng had a very lovely personality that students like to be with her, either discuss the content knowledge or shared feelings with her. She and her students generated good friendship in the class, and she also took role of their home-room class teacher, who needed to take care of students' general performance and their attitude in the class. Hung-Heng thought because of her role as home room class teacher, she could have more time to discuss with students about the merit of cooperative learning, and to know more about individual students. Students all knew they were using new learning strategies and would share their opinions with Hung-Heng to improve implementing methods.

Finding

Assertion one: For a group of high achievers with strong motivation to learn, what they concern in the class was whether group work could help them increase inner ability in the content learning. Therefore, the strategies used to increase group interdependence (such as, reward and identity interdependence), and team competition did not seem necessary for them.

Students enrolled in the class were high achievers with strong motivation. What they cared in the class were whether they could improve their learning, to get good grade in the class and finally they could pass competitive entrance examination to be enrolled in good university. Therefore, what were addressed in the literature (Johnson & Johnson, 1994) on the increasing interdependence, such as assigning role on each team member, giving them rewards as praise or extra grades were not only childish but also waste of time for them. They all responded that as long as

cooperative learning could help them improve their inner ability in the content learning, they would accept this kind of method. These students have a strong internal motivation, thus external reward did not seem to be helpful for them to work as a group. Same reason for using games to have team competition, they thought teacher could save this time for them to practice more forms of problem solving. Mastering problem solving could help them gain more points in the entrance examination one year later.

Assertion two: In order for students to get benefit from cooperative learning, students need to responsible for their own learning first, be prepared before they conduct group discussion.

Based on the students' response, it revealed that when students conduct group discussion, it was necessary for them to be responsible for their own learning first, they needed to study the content, understood the concepts taught in the class, or prepared the material or references first, before they have group discussion in the class. If students only tried to use group discussion to learn the concepts, without putting effort by themselves first, then the learning outcome would not be as good as they expected. On the other hand, students in the class used the discussion time very efficiently, thus they did not like to spend time discuss something without any solution and meaning.

Assertion three: Only until students get the benefit from the cooperative learning, would them appreciate using this approach in studying content.

As mentioned before, these group of students expected teacher to teach a lot of content knowledge in an organized way. Thus they were used of traditional teaching method. When Hung-Heng conducted group cooperative learning in the beginning of the semester, some students reacted as wasting their time to know more knowledge. However, after many times of sharing teacher's reasons why used cooperative learning, and monitor students to make better preparation before the discussion, students started to get benefit from cooperative learning. Some of them would continue to work as group after class or in math class.

Assertion four: The outcomes of cooperative learning for a group of high achievers were increasing students' reflective thinking ability, content learning, and social skills.

As mentioned before, this group of students had high competition, they needed to be very confidence to be success in the class. However, most of them felt pressured and lonely in this kind of competitive learning environment. Hung-Heng tried to create an harmony, non-threatening, and friendly learning environment for students to work cooperatively. At the end of the year, based on students' performance in the class and their responses in the questionnaire survey, most of them felt increase reflective thinking ability. In the group discussion situation, they could learn from each other how to interpretation phenomena in different perception, group member's questions could also stimulate their own thinking and reflective their ideas. The group activities and research project could also help them to understand better on the concepts they learned in the class. Finally, working as a team could provide opportunities to share feeling and emotion with each other. Students would encouraged and supported each other in the team, which did not only reduce the

loneliness and competition among students, but also to educate them appreciate other classmates' good ideas, and presentation performance.

Assertion five: Teacher needed to create an encouraging, monitoring, and optimal pressure learning environment. She also had to be flexible in stimulating students' thinking during her teaching, in order to both spark students' interests in conducing cooperative learning, and help students perform their potential ability.

In the beginning of the study, students were reluctant in conducting group activities for many reasons: loosing faces, waste of time, reduce their content learning. Hung-Heng tried to share her ideas constantly with students during their weekly classroom meeting. She also added group work gradually in her traditional lecture, gave students encouragement when students work as a group and when they presented their findings. When students failed in the class she maintain their face and encourage them to think in different approach. Hung-Heng also designed optimal difficulty level of problems for each group so that they needed to think and discuss carefully in order to have solution. She also assigned each group have report time to push students work together. She also increased group discussion time gradually instead of suddenly to help students adjust this kind of learning approach. Hung-Heng persistently used these strategies during her one year teaching, finally students were used to cooperative learning approach.

Assertion six: Testing culture, time constraints, existed curriculum paced, and characteristic of classroom culture were the factors influenced teacher in implementing cooperative learning.

As mentioned before, Hung-Heng's beliefs of helping students gain social ability, such as how to communicate with each other, and learn from each other were the important goals in her teaching, which made her changed her successful traditional teaching. However, in the first year, she only used group investigation in the class for this method did not use too much of her own teaching time, she could still teach content major by her self to the students. She arranged students into different groups having them conducted chemistry research projects and reported the research results at the end of each week. However, by the end of the first year, after knowing students' positive reactions to group activities, Hung-Heng started to have regular group discussion time in the class, she also tried to adapt Johnson & Johnson's (1994) suggestion of positive interdependence, individual accountability, face-to-face interaction, social skills, and group processing, into group work. Because of the testing culture, time constraints, and existed curriculum paced, students would expect Hong-Heng to teach the content by herself, and gave them time to discuss the variety forms of problem solving. Students would also care whether these strategies could help them get better grades or not. Senior high school textbook contained more content than junior high school, thus Hong-Heng also got pressure of the time limitation, so she used her homeroom teacher time to constant share the benefit of cooperative learning with students, which she could not done for the junior and seniors, because they did not provide enough time to share these ideas with students. Finally, Hung-Heng had used cooperative learning into different classes during these two years of study, she found out only the students have strong confidence and self disciplined students could they enjoy cooperative

learning. If the class filled with students who rely heavily on teacher's lecture and did not want to change one's learning pattern, the cooperative learning would not be very successful for them.

Conclusion

The above findings revealed some points for future science teachers to advertise new teaching methods for inservice teachers. First, the new teaching strategies much match with the teacher's teaching goals, so that she(he) felt the importance and have persistence to revise and implementing the new teaching methods into their classroom context. Second, Any new teaching strategies need a lot of effort for teacher and students to adapt, thus, teachers need to spend a great amount of time to design in the class. They also need to gradually adjust these methods into a teaching context where students were used to. Because each new teaching strategies need to change not only teacher's role, but also students' role and their learning pattern. This kind of change need a lot of time to adjust.

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